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Need-Based Justice and Distribution Procedures

Let's chat about justice in a fair distribution experiment

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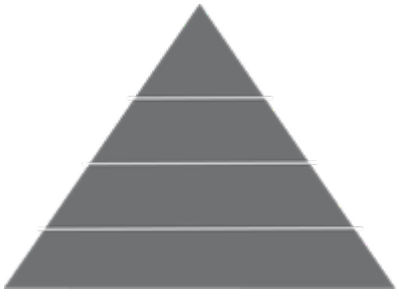

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Let's chat about justice in a fair distribution experiment

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Abstract: Language-based communication is an integral part of social interaction. A recent stream of laboratory experiments shows how even "cheap talk" substantially influences behavior. The present paper tests two hypotheses in the laboratory: the norm-based and the group-based explanation of the communication effect. The experimental design varies means of communication and interaction frequency in a three-person distribution task. Main results are that first, participants use different fairness principles depending on communication: free-form chat increases the relevance of the need principle, whereas restrictive numerical communication increases entitlement-based distributions. Second, a content analysis of the chat protocol shows differences in language use between matching treatments.

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1 Introduction

Language-based communication is an integral part of social life. Most human interactions are preceded, followed, and/or accompanied by communication. Communication fulfills different functions in interaction, such as facilitating the coordination of action, leading to a better understanding of social situations, promoting common knowledge, informing about others' individual preferences and beliefs, highlighting the presence of shared norms and values, and leading to the emergence of a shared group identity (Bicchieri, 2002; Bicchieri & Lev-On, 2007; Cason, Sheremeta, & Zhang, 2012).

A recent stream of empirical literature examines the effect of communication on behavior in different social situations and aims at understanding how and why it works. In this field, laboratory experiments provide solid results on the influence of communication on behavior in different social situations (e.g. reviews in Brandts, Cooper, & Rott, 2019; ?, ?; Charness, 2012), such as individual decisions, group decisions, or interactive coordination problems. For instance, in social dilemma situations concerned with the creation of public goods, communication notably increases cooperation rates, making them comparable to cooperation rates observed in peer sanctioning environments (Sally, 1995; Brosig & Weimann, 2003; Bochet, Page, & Putterman, 2006; Bochet & Putterman, 2009). Moreover, people are more generous when sharing with anonymous others when communication is possible (Bohnet & Frey, 1999; Banerjee, Chakravarty, & Ghosh, 2016; Andreoni, Rao, & Trachtman, 2017), and communication leads to more efficient outcomes of bargaining-processes (Gantner, Horn, & Kerschbamer, 2019). However, the "socially positive" effects of communication (Charness, 2012) are not always uncontested: experiments on the (fair) division of resources – mostly by means of bargaining – delivered diverging results. Whereas communication leads to more unequal distributions of a finite resource when voting is majority-based (Agranov & Tergiman, 2014; Baranski & Kagel, 2015), it leads to more equal distributions when voting is unanimity-based (Agranov & Tergiman, 2018). McGinn, Milkman, and Nöth (2012) argue that in bargaining-like settings, communication only leads to more equal distributions if interaction partners explicitly refer to fairness. To understand the effect of communication on distributive outcomes in bargaining situations, a deeper analysis of the communicative process and its content is necessary (Hegtvedt, 2007). Despite increasing interest in the effect of communication on behavior in laboratory experiments, content analysis of communication protocols is a relatively young field (Kalwitzki, Kittel, Luhan, & Peuker, 2015); communication protocols were previously regarded only as by-product. In general, costless non-binding communication

had been considered "cheap-talk" for many years (e.g. Ledyard, 1995). This statement has been revised considering the recent stream of literature showing the influence of communication on behavior in the laboratory (Brandts et al., 2019).

The present study tests the effect of communication content on distributive decisions in a network bargaining experiment. In contrast to previous studies, fairness is considered not only in terms of equality, but also the distributive justice principles of need and entitlement are examined. Thereby, this study's contribution is twofold: first, to the emerging branch of literature on the effect of communication content on behavior and, second, to justice research.

In the remainder of the present paper, relevant literature on communication in experiments is reviewed and used to formulate expectations for the bargaining experiment with full information on individual need states and status differences in structural power in three-person network structures. Section 2 presents describes the experimental design, Section 3 presents the results. Section 4 discusses the findings and 5 concludes.

1.1 Related literature: the influence of communication on behavior in the lab

Communication in laboratory experiments can be categorized along three dimensions (Brandts et al., 2019): (1) the channel: face-to-face, video, audio, chat, and paper-and-pencil, (2) the structure: direction, frequency, and order, and (3) the type of message: free-form, pre-formulated, and signaling.

Regarding the *channel*, face-to-face, video, and audio communications are richer in content than written channels because they include body-language and/or voice intonation, and maintaining anonymity is more difficult. In contrast, written content is less overlaid with personal sympathies and psychological mechanisms activated by physical appearance (Bicchieri, Lev-On, & Chavez, 2009). A notable advantage of computer-mediated communication is its self-documenting character, compared to face-to-face interaction.[1] Regarding computer-mediated channels, it appears that in public good games video communication most effectively increases contributions, audio communication is similarly effective, and text-based chat is less effective but nevertheless substantially powerful (Bicchieri & Lev-On, 2007). In a trust game varying the communication channel, Bicchieri et al. (2009) show that cooperation rates decrease from face-to-face interaction to computer-chat and are lowest in the no communication treatment. Overall,

[1] Written chat as a communication medium is particularly practical because, in contrast to spoken language, it does not require transcription (Kalwitzki et al., 2015).

computer-mediated communication is less effective than face-to-face, but is frequently significant in influence. The remainder of this article is concerned with computer-mediated communication.

The *structure* of communication (Brandts et al., 2019): direction, frequency, and order can be controlled easily in laboratory experiments – i.e. who can communicate with whom, how often, and when.[2] Bicchieri and Lev-On (2007) conclude that, compared to no communication settings, one-way messages do not significantly increase cooperation concerning public good provision. Regarding multi-directional and multi-party communication, Cason et al. (2012) show that inter and intra-group communication have different effects on cooperation in a competitive-between-groups public good game. Whereas communication within groups leads to more competitive behavior towards the out-group and more in-group cooperation, between-group cooperation leads to higher rates of cooperation and more beneficial outcomes for all. Regarding the publicity of communication, Baron, Bowen, and Nunnari (2017) show in a distribution experiment on coalition building that using a public communication structure leads to more frequent universal coalitions, whereas private communication structures increase the number of majoritarian coalitions. Furthermore, public and private chat structures are used for different purposes in fair division problems involving individual claims (Gantner et al., 2019). Public communication increases the frequency of equal distributions, whereas private communication increases the frequency of equitable distributions. Regarding the timing of communication, Capizzani, Mittone, Musau, and Vaccaro (2017) show that even anticipated post-interaction communication increases the frequency and the amount of shared resources as well as acceptance rates in the ultimatum game.

The third dimension concerns the *type* of transferred messages. The type of message influences the content: messages can be restricted to numbers, pre-formulated text, or be entirely unrestricted.[3] A single number or word is a minimal form of communication, conveying limited information; for instance, it may signal the willingness to pay a certain price or a negotiation offer. Pre-formulated phrases can be used to control the range or depth of content (not feasible in video communication).[4] Unrestricted messages

[2]Communication can be structured one-way, two-way, or multi-way; occur once, repeatedly at intervals, or continuously; and within or without a time frame. It can happen before, during, or after a decision or interaction sequence. Communication can occur sequentially (one person speaks, then the other) or simultaneously.

[3]Restricting the message type is considerably more difficult in face-to-face communication (physically present and computer-mediated via video) than it is with text-based communication.

[4]For example, some companies require reshipment-statements where buyers can select reasons for reshipment from a list of statements. Some online help-centers for computer programs only allow a

can be used in all channels and all structures introduced above; they allow for the transmission of the richest content. Comparing restrictive numerical communication and pre-formulated messages[5] regarding cooperation in a standard public goods game, Bochet and Putterman (2009) find numerical communication to be inefficient without promises, but contribution promises are effective only when actors act truthfully on their promises. Relatedly, in a threshold public goods experiment, Palfrey, Rosenthal, and Roy (2017) compare the intention to contribute (yes/no), submission of a number (of tokens intended for contribution), and free-form unrestricted chat; they find that the richest communication treatment leads to significantly higher rates of cooperation, higher individual contributions, and higher payoffs. Bicchieri et al. (2009) show that cooperation rates are higher in a trust game with face-to-face communication compared to chat communication, but only if the content is unrestricted; the difference disappears when all game-related talk is forbidden (?, ?, see)for further references to empirical work on the combination of all three dimensions]Brandts2019.

Chat communication, the focus of the present study, has been used in different types of experiments; however, bargaining experiments and other interactive fair division settings are underrepresented.[6] This is surprising because classical bargaining experiments previously used restricted numerical communication in two different fields: social exchange experiments in the sociological and social-psychological tradition of social exchange theory (for review see Neuhofer, Reindl, & Kittel, 2015) and bargaining experiments in behavioral economics (for review see Charness, 2012). By definition, the dynamic activity of bargaining requires a minimum of communication: suggestion of prices (bidding), the division of resources, and the proposal of counteroffers. In most studies, the type of messages was restricted to numbers; this numerical bargaining process was not explicitly defined as means of (restricted) communication.

More recent studies explicitly examine the effect of unrestricted chat on distributive outcomes in contrast to numerical bargaining in several different types of fair-division settings; however, the direction of their findings is yet inconclusive. Whereas Gantner et al. (2019) show that chat leads to more egalitarian distributive outcomes and participants' agreements are more efficient, other resource division studies show that chat leads to more unequal outcomes than bargaining in a Baron-Ferejohn experimental setup

pre-selection of messages to be sent.

[5] "promising to contribute/not to contribute"

[6] The dictator game is a one-way decision; ultimatum and trust games, even though interactive in terms of action and re-action, are sequential games. In contrast, interactive bargaining games and fair division games with voting mechanisms capture continuous action and reaction.

with majority voting (Agranov & Tergiman, 2014; Baranski & Kagel, 2015). However, communication leads to more equal outcomes under the unanimity rule in an otherwise identical setting (Agranov & Tergiman, 2018). In these experiments, the proposer loses her bargaining power after each proposal. To the best of my knowledge, no study directly compares the effect of chat communication to bargaining in a stable, interactive fair division environment, such as in a classical social exchange type of setup.[7] In this environment, all actors can propose divisions and the structurally-advantaged position is less pressured with the loss of power – the bargaining and communication process can unfold under less stress. Considering diverse communication effects, it can be expected that chat communication also significantly influences distributive outcomes in stable network exchange situations.

Hypothesis 1 *(type of message): Unrestricted chat communication decreases the frequency of unequal distributive outcomes and increases the diversity of different types of distributive outcomes compared to restrictive numerical bargaining.*

1.2 Why communication changes distributive outcomes

Some of the above-discussed differences in outcomes were attributed to the communication content (e.g. Agranov & Tergiman, 2018). McGinn et al. (2012) show that only experiment-relevant chat significantly influences the outcome in a bargaining experiment. Reviewing the literature on communication effects (mostly in social dilemma-type settings), Bicchieri (2002) concludes that two hypotheses are commonly used to explain the communication effect: the norm-based hypothesis and the group-based hypothesis. Proponents of the norm-based hypothesis argue that communication can underline the normative context of a social situation: actors learn about relevant norms through language-based cues, and they use language to actively frame situations according to different norms.[8] Proponents of the group-based hypothesis argue that communication shifts the focus and identity of an individual from the self to the group. With communication, a shared group identity can emerge. When the self is perceived as part of the

[7] In social exchange experiments, negotiation power and the network structure are usually stable within a period, often for the entire experiment, in contrast to Baron-Ferejohn-expeirments.

[8] A different stream of literature studies the effect of framing using ex-ante labels for experimental games, spearheaded by Tversky and Kahnemann. Liberman, Samuels, and Ross (2004) show that the label of a public goods game as a "community game" leads to substantially higher contributions compared to the identical game labelled as a "wall street game". Eriksson and Strimling (2014), and similarly Hagauer, Kittel, and Schwaninger (2019), show that in the absence of explicit labels through the experimental design, participants nevertheless label the situation by themselves, correlating with different behavior.

group, individual interests (such as maximization of private profits) are relegated to the benefit of the group interest.

Recent experimental studies support both hypotheses; however, it appears that resource-division or interactive distribution experiments have been more concerned with the norm-based hypothesis, whereas coordination games and non-interactive distribution experiments have focused more on the group-based explanation. The results of McGinn et al. (2012), who compare a selection of pre-defined messages prior to free-form chat in a bargaining experiment on norm-framing by language, support the norm-based explanation: talk about fairness leads to more equal outcomes, while competitive reasoning leads to more unequal outcomes. In different experimental setups concerned with distributive tasks, Agranov and Tergiman (2018) and Gantner et al. (2019) corroborate the outcome-equalizing effect of fairness-talk. However, not all talk about fairness is equalizing. Neumann, Stephan, and Vogt (2017) show participants highlighted efficiency as a relevant fairness norm in longer conversations, whereas in shorter conversations they emphasized equality.

It is possible that different fairness norms are promoted through communication, not only equality (Neumann et al., 2017). Nevertheless, most studies on fair divisions focus on the norm of equality in contrast to unequal distributions according to the justice principle of equity (i.e. distributions proportional to structural advantage or preceding effort of actors) or on the goal of efficiency. However, justice research usually distinguishes between four normatively-founded distributive principles: equality (mostly of outcomes), equity (output proportional to input), entitlement (differences according to status), and need (e.g. Fiske, 1992; Liebig & Sauer, 2016; Konow & Schwettmann, 2016).[9] Therefore, the question arises if other fairness norms, such as the norm of need-based justice, can be as effectively promoted in communication as the principle of equality and if they can affect distributive outcomes. The distributive principle of entitlement had been consolidated with the principle of equity in many bargaining experiments, but the need principle has not been examined in this context so far. According to the norm-based explanation, the

[9]The distributive rule of entitlement allocates greater shares to the person with higher ascriptive status; the outcome/share is calculated on the relative position in a hierarchy of individuals. The principle of equity allocates greater shares to the person with greater input and smaller shares to the person with smaller input; the outcome/share is calculated based on individual effort. Even though the basis of calculation differs, both distributive principles lead to unequal outcomes. Some experiments (e.g. Cook & Emerson, 1978; Rodriguez-Lara, 2016) argue with the principle of equity when examining bargaining power, even though bargaining power was randomly allocated to participants by the computer program and was therefore actually closer to entitlement in concept. In the present paper, unequal distributions achieved by application of eternally-ascribed bargaining power (structural position in the network) are referred to as entitlement-based outcomes.

effect observed for equality should also work for the distributive principle of needs.

Hypothesis 2 *(norm): Unrestricted communication is expected to increase the application frequency of different fairness norms through references to different norms.*

The group-based hypothesis mainly derives from situations where personal and group interest conflict, such as social dilemmas. In distributive decision contexts, the conflict lies between individual payoffs and others' payoffs as individuals, leading to a conflict of individual preferences and fairness norms. This provides an interesting context for the group-based hypothesis not yet thoroughly examined. Several justice theories argue that the relevance of fairness norms varies systematically with the social context, whereby the type of social relationship between actors is considered crucial (Fiske, 1992; Miller, 1999; Liebig & Sauer, 2016). Accordingly, increased social closeness and group cohesion highlights the relevance of the need principle, whereas social distance and formality promote equity and entitlement norms. In long-term relationships without a focus on social bonds, equal distributions are the norm (Fiske, 1993). In general, use of communication allows to define the situation as one relationship type or another, thereby highlighting different norms (Esser & Kroneberg, 2015; Bicchieri, 2002); for example, in a situation where the group interest is more important than the individual, the group is highlighted as the normative reference frame (or vice versa). Therefore, if communication is used to promote group cohesion, the fairness norm most relevant in close groups (theoretically needs) should be applied more frequently.

Bicchieri (2002) attributes explanatory power to both hypotheses but argues in favor of the norm-based explanation. Accordingly, the strongest adherence to the distributive justice principle of needs should therefore be found in situations where communication is used to highlight the relevance of the fairness norm of needs and the group context of the social situation. However, in comparison, the effect of norm-frames on distributive outcomes should be stronger than the effect of group cohesion facilitated by communication.

Hypothesis 3 *(group): Unrestricted communication is expected to increase the application frequency of different fairness norms through references to the group context.*

Hypothesis 4 *(group+norms): Highlighting the group context increases the frequency of need-satisfying and equal distributive decisions and decreases the frequency of entitlement-based and equity-based distributive decisions.*

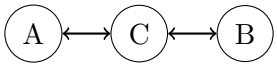

Figure 1: Three-line network

2 Materials and Methods

To address the norm-based and group-based hypothesis about the influence of communication content on behavior, two laboratory experiments were implemented. The experimental design was inspired by a recent study by Kittel, Neuhofer, and Schwaninger (2020), who developed a method to include the distributive justice principle of need into the classical design of social exchange bargaining experiments. With this design, it is possible to create an action space including three fairness principles that are also recognized in distributive justice research: equality, proportionality (equity/entitlement), and need.

2.1 Experiment 1: fairness communication

Experiment 1 had two between-subjects treatments: unrestricted chat communication (tCS) and communication restricted to numerical characters (tNS). It had two main stages: *(S1) exchange stage (with communication)*, and *(S2) real-effort task*. Participants could only participate in S2 if they successfully completed S1. In total, 8 periods were played, whereby stranger matching was used (participants interacted with different people in each period).[10] At the conclusion of the experiment, subjects completed a questionnaire to provide sociodemographic data.

(S1) Exchange stage. In S1, subjects had to distribute a fixed pool of resources (24 points) in three-person bargaining networks (see figure 1). Everyone needs an exogenously determined share of the resource – i.e. the need threshold (see below) – to be admitted to S2. Subjects could communicate with their connected network members for three minutes;[11] in treatment tCS participants could send free-form text messages, in tNS participants could send an unlimited number of distribution suggestions in the form of numbers. The first binding agreement between a dyad applied to all three network members. Subjects were informed about the distributive decision and whether their points sufficed to meet their individual need thresholds. Points received in S2 constituted

[10] see Appendix **??** for instructions

[11] Three minutes was the maximum time frame. If a binding agreement to a distribution was made before the maximum of 3 minutes, the entire network left the communication stage together.

a private payoff, irrespective of whether they reached the threshold. If no distribution agreement occurred within three minutes, all network members received zero points in this period.

(S2) Real-effort stage. In this stage, participants could earn additional points with real-effort tasks if their share of the resource received in S1 was at least equal to their individual need threshold. Tasks included: summing digits, counting capital letters in random strings of letters and numbers, and answering general knowledge questions. Points earned in this stage were added to the points received in S2.

Network structure. In each period, participants were randomly matched (as strangers) in three-person interaction networks: the "three-line" network of the form A – C – B (see figure 1). This network can show the influence of structural hierarchy on distributive. The three-line network is a so-called strong-power network (Willer, 1999) because the "broker" position (C) holds more structural power than both "peripheral" positions (A, B) if only one agreement per round is possible and binding decisions are made within dyads (peripheral positions cannot communicate with each other). Hence, one of the peripheral positions is inevitably excluded from the agreeing dyad, but the broker can never be excluded. The broker can obtain a larger share of the resource since the two peripheral subjects will end up in a downward-spiraling bidding war to avoid exclusion (e.g. for details Cook, Cheshire, Rice, & Nakagawa, 2013; Molm, Collett, & Schaefer, 2007). Subjects remained in the network position to which they were assigned in the first period for the entire experiment (8 periods).

Need thresholds. In each period, participants were assigned individual need thresholds; threshold levels were common knowledge. A combination of thresholds within a network is referred to as a scenario. Four different scenarios were implemented (notation: "c" is the central network position): (1) equal thresholds: 5 – c5 – 5 (everyone needs 21% of the resource), (2) unequal symmetrical: 9 – c5 – 9 (36–c21–36%), (3) strongly unequal: 13 – c5 – 5 (54–c21–21%), and (4) unfulfillable: 13 – c5 – 13 (54–c21–54). Each scenario was repeated twice in an experimental session; the order of scenarios was the same for all sessions (for detailed argumentation on the choice of thresholds see Appendix table **??**).

2.2 Experiment 2: group communication

Experiment 2 used the same design as experiment 1, but instead of randomly re-matching network members in each period (stranger matching), participants remained in the same network throughout the entire experiment (partner matching). Experiment 2 addresses

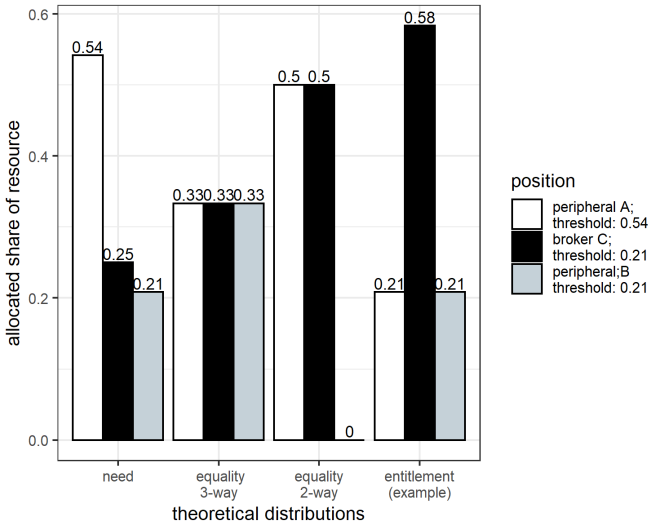

Figure 2: Theoretically derived distribution of outcomes in three-person interaction with different need-thresholds (scenario c5-c5-1,3 for example) and different structural positions

the group-based explanation of the effectiveness of communication. Bicchieri (2002) argues that pro-social behavior is only interesting in one-shot interaction because there is no obvious incentive to behave pro-socially (e.g. reciprocity or reputation formation). However, in one-shot interactions, social identity can only emerge to a limited degree; repeated interaction can create social cohesion even when direct reciprocity or reputation formation are not possible by design (e.g. Kuwabara, 2011).

2.3 Measurements

Support for a fairness-norm can be inferred from the distributive outcome; outcomes can be compared to norm-related distributive principles. The experimental design provides an action space that allows for three theoretically distinct distribution types (see figure 2).

Entitlement/equity/proportionality. Distributive outcomes implementing the equity principle allocate larger shares to the structurally-advantaged position (C). In the case of the present experiment, no effort precedes the distribution stage. Status is therefore not obtained by effort, but by ascribed network position (allocated by luck); therefore, it is more precise to refer to them as entitlement-based (Fiske, 1992; Liebig & Sauer, 2016). All distributions allocating 37.5% (9 points) or more to C belong to this category (if not part of another category). This includes distributions that satisfy one or two need

thresholds.

Equality. Distributive outcomes can assign equal shares to two or all three network members: equal two-way splits allocate 50% of the resource (12 points) to two individuals and 0 to the third; equal three-way splits allocate exactly 33.33% (8 points) to everyone.[12]

Need. The need principle is measured by observing the frequency of cases where an individual participant managed to obtain enough points to reach her threshold (individual need-satisfaction-rate, short NSR-I); NSR-I equals 1 if the threshold was fulfilled and 0 otherwise. NSR-I can be aggregated on the network level (NSR-N); NSR-N equals 1 if all thee network members' need thresholds were satisfied and 0 otherwise. All distributive outcomes where NSR-N = 1, but are not part of another principle, belong to this category.

2.4 Procedure

The experiments were implemented in the laboratory of (placeholder) in 2018.[13] At the lab, participants received randomly shuffled numbered seating cards corresponding to individual computer terminals. Computer terminals were separated with partitions to minimize face-to-face interaction and maximize anonymity. All participants received written instructions containing full information about the setup of the experiment and the incentive structure. The language of the instructions was as neutral as possible (see Appendix **??**).[14] Participants completed a questionnaire on the rules of the experiment and participated in a non-payoff relevant trial round. During the trial round, participants could ask the experimenter clarifying questions. After the experiment, participants were asked to individually approach the experimenter and exchange their numbered seating card for monetary payoff. At no point were individuals informed about the names or earnings of the other participants.

[12] See Schwaninger, Neuhofer, and Kittel (2019) for a discussion of the relevance of the possibility of network-wide allocations in contrast to allocations within the agreeing dyad.

[13] The (placeholder) laboratory adheres to principles of economic experiments and have obtained a waiver from their institutions' ethics commissions (placeholder). Prior to participation, all subjects were asked to read and sign a consent form. Students of all universities in the city are invited by advertisement to become part of the subject pool of the laboratory. As part of this pool, students are regularly invited to participate in experiments via mail.

[14] Prior to the main part of the experiment, participants completed the Social Value Orientation measure (Murphy & Ackermann, 2014), a financially incentivized tool to asses social value orientations, but were only informed about their payoff after the experiments. Before ending the experiment, participants completed a questionnaire regarding their experiences in the game and socioeconomic characteristics.

2.5 Sample

In experiment 1, a total of 81 students participated in the chat treatment (tCS) and 48 participated in numerical bargaining (tNS); in experiment 2, a total of 81 participated in the chat treatment (tCP) and 78 participated in numerical bargaining (tNP). Each session lasted for 1 hour 45 minutes and the average payoff was 22.16 Euros (sd = 6.01). One period (of 8) was randomly chosen for payoff. At the end of each session, participants were paid their earned points in Euros. The samples do no differ significantly between experiments; therefore, demographic characteristics are summarized. 60% of participants were female, with a median age of 23 years (mean = 23.75, sd = 5.08); modal fields of study are social and behavioral sciences (25%), 20% study human sciences, 22% natural sciences, 14% technical sciences, 12% economics, and 8% life sciences. Roughly 50% of participants stated they 'have lived half of their life' in Austria, while 13% state in Germany; this information is used as proxy for proficiency in the German language which is important for understanding the instructions to the experiments and to use the communication tool. The median of previous participation in experiments is 3 times (mean = 5.31, sd = 6.24).

3 Results

3.1 Restricted vs. unrestricted communication

Table 1: Frequency of application of distributive principles (entitlement, equality, and need)

		entitlement	**equality**		**need**	**other**
		share of C > 33.33%	eq. 2-way split	eq. 3-way split	NSR-N = 1	
experiment 1	numerical	37.5	19.79	21.88	19.79	1.04
(stranger)	chat	16.67	9.88	31.48	36.42	5.56
experiment 2	numerical	14.74	19.87	27.56	35.26	2.56
(partner)	chat	6.17	4.32	32.72	53.09	3.7

Note: Columns display the frequency of application of distributive principles (for description of principles, see measurements above); scenario 13-c5-13 is excluded because NSR-N = 1 is not possible; N = 576 network decisions. See Appendix figures **??**, **??**, **??**, and **??** for graphical display of each scenario.

Table 1 reports the average frequency of application of the distributive principles of entitlement, equality, and need. The frequencies differ substantially between commu-

nication treatments (supporting H1). In *experiment 1* with numerical communication (tNS), the entitlement principle is, on average, most frequently applied (37.5%), the need principle (19.79%), two-way and three-way equality are similarly low in frequency (19.79%; 21.88%; z-test, p-value = 0.608; CI 95% [-0.91; 0.049]). In comparison, chat communication (tCS) substantially increases the frequency of need-based distributions by 16%p (z-test, p-value < 0.001; CI 95% [-0.232; -0.101]) and decreases entitlement-based distributions by 20%p (z-test, p-value < 0.001; CI 95% [0.141; 0.276]). The overall frequency of equality is similar between treatments; however, the emphasis shifts from two-way (9.88%) to three-way equality (31.84%) when moving from numerical to chat communication.

> *Result 1:* Unrestricted (chat) communication increases the frequency of application of the need principle and decreases the frequency of entitlement; the opposite occurs with restricted (numerical) communication.

In *experiment 2*, participants interacted repeatedly with the same network members (i.e. partner matching) to examine the effect of group identity in communication. Regarding communication treatments, the proportion of frequencies of distribution principles is roughly the same between experiments. The support for need increases substantially by 18%p (z-test, p-value = < 0.001; CI 95% [-0242; -0.114]) and entitlement decreases by 9%p (z-test, p-value < 0.001; CI 95% [0.045; 0.126]) when moving from numerical (tNP) to chat communication (tCP).[15] Group interaction increases support for the need principle and decreases support for the entitlement principle in contrast to interaction with strangers.

Comparing both experiments shows that communication (restricted, unrestricted) and interaction frequency (partner, stranger) affect the application of distributive principles differently. On average, entitlement is most strongly supported by restricted communication and stranger matching (tNS; 37.5%), while it is least strongly supported by unrestricted communication and repeated interaction between partners (tCP; 6.17%). The need principle receives the strongest support through group interaction and unrestricted communication (tCP; NSR-N at 53%), and the weakest support through stranger interaction and restricted communication (tNS; 19.79%). The frequency of need-based distributions is indistinguishable between tCS and tNP (z-test, p-value = 0.46; CI 95%

[15] Comparing both experiments, a similar shift occurs; however, the increasing effect of repeated interaction in experiment 2 on need-support is slightly stronger (by 2%p) and the decreasing effect on entitlement-support is substantially weaker (by 11%p) than in experiment 1.

[-0.037; 0.087]). Equality is least affected by treatment variations. Overall, inclusive distributive principles are applied more frequently in tCP: equal two-way splits are least frequent, and equal three-way and need-based distributions - both principles include all three network members – accumulate to approximately 86%.

3.2 Affluence, Scarcity, and meta-fairness

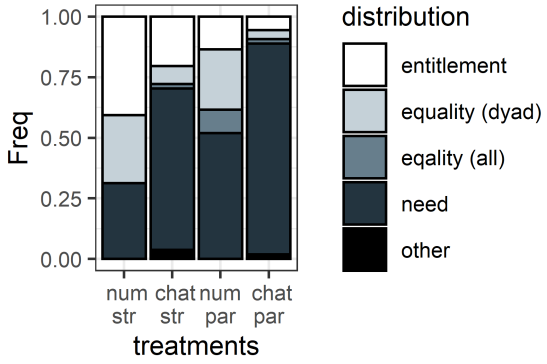

Figure 3: Frequency of distributive principles in scenario 5-c5-13. Both chat treatments exceed bargaining treatments in frequency of need satisfaction

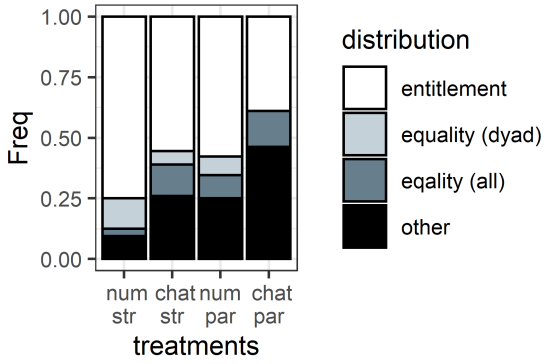

Figure 4: Frequency of distributive principles in scenario 13-c5-13. c5-13-13: tCP has largest share of "other distributions"; chat allows coordination on non-obvious norms (such as alternating need satisfaction between periods "meta-equality")

The above-presented frequencies are summarized across all need threshold scenarios of affluence. Figure 2 displays scenario 5-c5-13;[16] in this scenario, all three distributive

[16]Mean frequencies above include scenario 5-c5-5; in this scenario, three-way equal distributions are also need-satisfying (i.e. NSR-N = 1).

principles are in conflict. The support for entitlement decreases stepwise from tNS (40.62%) to tCS (20.37%) in experiment 1 and furthermore from tNP (13.46%) to tCP (5.56%) in experiment 2. In contrast, two-way equality is more strongly affected by differences in communication treatments within experiments (tNS vs. tCS, z-test, p-value = 0.171, CI 95% [-0.150; 0.024] and tCS vs. tCP, z-test, p-value = 0.017, CI 95% [0.012; 0.169]) than by differences in matching between experiments (tNS, 28.12% vs. tNP 25%; z-test, p-value = 1, CI 95% [-0.060; 0.059] and tCS 7.41% vs. tCP 3.7% z-test, p-value = 0.002, CI 95% [0.019; 0.088]). Three-way equality is only supported in tCP (9.62%). The need principle receives the strongest support in tCP (87.04%) and the least support in tNS (31.25%). Like entitlement, support for need varies with communication and interaction frequency but in the opposite direction. Regarding needs, communication and interaction frequency are apparently two independent effects (additive, not interactive): communication increases need-satisfaction by 30% and repeated interaction with partners increases need-satisfaction by 20% (see figure3; see Appendix table **??** for frequencies).

In contrast to figure 3, figure 4 displays a scenario with insufficient resources (i.e. sum of need thresholds exceeds available resources); NSR-N is necessarily always smaller than 1. Therefore, only entitlement and equality compete. In this case, entitlement receives the strongest support in tNS (75%). Figure 4 displays a notably larger share of "other" distributions that do not belong to a distributive category, particularly frequent in tCP (46.3%). Chat protocols reveal that participants developed different distributive rules when repeatedly interacting with the same partners. They alternated which two people could satisfy their needs, or the central participant with the 5 points need threshold claimed 5 points and distributed the rest equally between the other two who could not satisfy their thresholds.

3.3 Communication content: norms and group identity

To differentiate between the norm-based and group-based explanation of the communication effect, a content analysis of the text material of the chat protocols of experiment 1 and 2 was used. For the analysis of the chat protocols, a code and language-based approach was used, based on content analysis (Coe & Scacco, 2017).[17]

[17]Chat data produced in experiments differ from other kinds of communication or text data. In the context of this study the content of conversation is strongly driven by the experimental situation. The content is therefore "relatively shallow", concise and specific. Chat data, in general, are often characterized by different use of grammar, half-sentences, and typos, compared to other texts, such as interview protocols. Furthermore, references are often implicit and less clear than in other texts or communication forms (Kalwitzki et al., 2015).

3.3.1 Codes of content analysis

Two main categories of codes – norm-related and group-related – were developed. Norm-related codes are: "fairness positive", "fairness negative", "need neutral", "need negative", "equality three-way", and "equality two-way". Even though "entitlement" is relevant in theory and applied in both experiments, the text material did not contain verbal references thereto. Group-related codes are "references to other participants" and "references to dyad". To account for reciprocal behavior due to repeated interaction in experiment 2, the category of reciprocity was included, containing the codes "time horizon past" and "future" (see Appendix table **??** for description of categories and examples). Additionally, the code of "smileys" emerged from the text-material; filing it into a miscellaneous category. Participants frequently used combinations of symbols for commonly known digital facial expressions (e.g. :-), ^^). The analysis includes this code because of its frequency.

Table 2: Absolute and relative frequencies of content analysis codes

		Experiment 1		**Experiment 2**	
		abs. freq.	**rel. freq.**	**abs. freq.**	**rel. freq.**
norm	fair	82	2.45	63	2.17
	unfair	29	0.87	32	1.1
	need neutral	127	3.79	72	2.48
	need negative	43	1.28	62	2.14
	equal 3-way split	176	5.25	172	5.93
	equal 2-way split	42	1.25	7	0.24
group	reference to others	44	1.31	83	2.86
	reference dyad	139	4.15	13	0.45
reciprocity	future	1	0.03	52	1.79
	past	4	0.12	65	2.24
miscellaneous	smiley	270	8.06	142	4.9
N	total messages	3351		2899	
	total words	9331		10614	
	total unique words	1176		1337	

Table 2 displays absolute and relative frequencies of codes. Comparing the structure of the text material between experiments shows that participants sent fewer, but longer, messages and used a greater variety of words in experiment 2 (tCP) compared to experiment 1 (tCS). The most frequently used norm-code was "three-way equality" in both experiments. The most frequently used group-code was "reference to dyad" in tCS

and "references to others" (beyond the dyad) in tCP, indicating that the time frame of stranger matching permits only a limited shared social identity for the entire network, but more strongly for the interacting dyad in experiment 1, whereas the opposite occurred in experiment 2. The reciprocity category also notably differs between experiments: time references are almost nonexistent in tCS but frequent in tCP. In contrast, smileys were used considerably more often in tCS. The reported codes do not correlate substantially (see correlation matrix in tables **??** and **??** in Appendix).

> *Result 2:* Participants communicate different norms and refer to their network members when communication is unrestricted. Frequencies of codes regarding group and reciprocity differ between stranger interactions and repeated partner interactions.

3.3.2 The influence of communication content on distributive outcomes

Table 3: Multinomial logistic regression of language codes on distributive outcomes in experiment 1 (stranger); exponentiated coefficients (odds)

	intercept	**need neutral**	**equality 3**	**ref. dyad**	**smiley**
Dep. var. cat.:					
entitlement	2.3263	2.3962+	0.0243***	6.9912***	1.4861
need	8.5980***	2.8508*	0.0158***	0.8648	1.3092
other	2.3785	2.0535	0.0521***	4.5643***	0.951
Resid. Dev.	500.5328				
AIC	530.5328				
N	243				

Note: ***p $<$ 0.001, **p $<$ 0.01, *p $<$ 0.05, +p $>$ 0.1; for coefficients see Appendix table**??**

To examine the influence of communication content on distributive outcomes, multinomial logistic regressions with norm-related outcomes (entitlement, equality, need, and other distributions) as dependent variable were computed for both experiments. Since frequencies of codes were considerably different between experiments, the models cannot be compared directly. Table 3 shows the exponentiated coefficients (relative risk ratios) of experiment 1, using the distributive outcome of *three-way equality* as the reference category (see Appendix table **??** for coefficients and standard errors). The principle of equality is useful for comparison to other experiments and frequently referred to as "default outcome" theoretically (?, ?, e.g.)]Miller1999; however, its frequency of application in the present study's chat treatments was notably exceeded by the need principle. Norm-

related codes and references to other network members significantly influence distributive outcomes, supporting both the norm-based (H 2) and the group-based explanation (H 3).

Result 3: References to distributive norms influence distributive outcomes.

Result 4: References to other participants influence distributive outcomes.

In more detail, by differentiating between norm-related expressions, the analysis shows that the occurrence of expressions of equality leads to more equal outcomes and fewer need-based and entitlement-based outcomes. Compared to equal outcomes, the predicted probability of a need-based distribution decreases substantially and significantly from 0.60 to 0.10 (entitlement 0.16 to 0.04), moving from no expression of equality to at least one occurrence (no expression of other codes). Regarding references to other group members, at least one reference to the dyad substantially and significantly increases the predicted probability of entitlement from 0.16 (no reference) to 0.46, whereas it substantially decreases the predicted probability of need-based outcomes from 0.60 to 0.21.

Table 4: Multinomial logistic regression of language codes on distributive outcomes in experiment 2 (partner); exponentiated coefficients (odds)

	intercept	**need neutral**	**equality 3**	**ref. group**	**ref. time**	**smiley**
Dep. var. cat.:						
entitlement	1.6576	1.7162	0.0424***	8.7149**	0.7302	0.8577
need	7.1134***	4.0620**	0.0178***	3.2076	0.8299	0.9894
other	2.5869*	4.1050**	0.0213***	3.2052	1.6403	0.4399
Resid. Dev.	488.4636					
AIC	524.4636					
N	243					

Note: ***p $<$ 0.001, **p $<$ 0.01, *p $<$ 0.05, +p $>$ 0.1; for coefficients see Appendix table**??**

Controlling for effects of reciprocity (experiment 2, table 4) decreases the frequency of dyad-references and increases the frequency of references to the other network member. Therefore, the dyad code was exchanged with the group code for the regression of experiment 2. Notably, references to the time frame (i.e. reciprocity) show no significant influence on the distribution of norm-related outcomes. Otherwise, the influence of chat content appears similar between experiments. References to equality significantly and notably increase the predicted probability of equality (0.08 to 0.8, no other references)

and decrease the predicted probability of need-based outcomes substantially (0.58 to 0.1) and entitlement-based outcomes slightly (0.13 to 0.6). Need-references substantially and significantly increase the probability of need-based outcomes and decrease the frequency of entitlement-based outcomes.

4 Discussion

The results of both experiments support previous research comparing restricted and unrestricted communication: distribution outcomes differ substantially and significantly between communication treatments (supporting H 1). Unrestricted communication leads to more frequent application of inclusive distributive principles; three-way equality and need allocate lead to the allocation of something to the third individual, whose agreement to the distributive outcome is not required to implement it. The positive influence of unrestricted communication is strongest on the need principle. The need principle appears to be a more demanding norm to coordinate on because, first, not all resources are always used when satisfying all needs (what should be done with the rest?) and, second, it is not clear whose needs are relevant – the needs of the agreeing dyad, or the needs of all network members. In comparison, equality and entitlement are less demanding in terms of communication: the network position clearly defines who gets more, and equality is subject to a simple mathematical operation.

Regarding the norm-based and the group-based explanations of the function of communication in experiments as discussed by Bicchieri (2002) and others, a content analysis showed both explanations have merit. First, communication is clearly and effectively used to highlight norms, thus supporting H 2. Interestingly, only the norm of equality is used directly with significant impact on all outcomes (negative regarding needs and entitlement, positive regarding equality). In comparison, expressions of need significantly increase the application of the need-norm but do not influence other distributive outcomes notably. Keeping the rather high frequency of need-based distributions in chat treatments in mind, it is possible that the presence of need thresholds already induces the relevance of need-satisfaction as a norm to a notable degree. A recent study by Kittel et al. (2020) shows that needs matter substantially, even if the satisfaction of other participants' needs directly translates into smaller individual payoffs for those with lower needs. Second, highlighting the group context influences the outcome consistently in experiment 1 (supporting H 3) but not in experiment 2. However, contrary to expectations, it is not the positive formation of a group identity of the whole interaction network but the verbal

restriction to a smaller social entity that influences outcomes. References to the dyad consistently and significantly increased entitlement-based outcomes and decreased need-based and quality-based outcomes, indirectly supporting H 4. In experiment 2, there was no substantial effect from group codes despite controlling for codes targeting reciprocity. This could indicate that more complex processes underly the cooperation-enhancing effect of communication.

The finding that the need principle receives strongest support through unrestricted chat communication and repeated partner interaction, while the entitlement principle's strongest support comes from restricted numerical communication and stranger matching resonates well with prominent justice theories. Fiske (1993) and Liebig and Sauer (2016) argue that the need principle is more relevant in socially close relationships, whereas the entitlement principle and equity principles do not require social closeness or group identity. It can be inferred that the possibility and use of unrestricted communication and partner matching are sufficiently strong situational cues for interpreting the social situation as relatively close and, as a result, for inducing and highlighting the relevance of need-satisfying distributions as relevant justice norms. Relatedly, stranger matching and numerical bargaining as communication tools seem sufficiently strong situational cues for defining the situation as one where relative status matters and, as a result, activating more individualist norms of entitlement or equity.

5 Conclusions

Many previous studies showing the influence of communication on behavior used unrestricted face-to-face interaction (Sally, 1995; Kagel & Roth, 1995), while a few used computer-mediated and text-based communication (Bicchieri & Lev-On, 2007). Most computer-mediated studies restricted the type and structure of messages. However, the increasing importance of computer-mediated written communication for human interaction cannot be denied. Technological innovation has increased communication speed: whereas letters take days (or weeks) to reach their destination, internet-based text-messaging services take seconds to transfer written or audio-visual content. Innovation has furthermore decreased communication costs for many people; while snail-mail stamps and short-message-services (SMS) used to be relatively expensive and limited in space, e-mails and e-messages sent via internet-based instant-messaging services are relatively cheap and unlimited in length and, thus, richness of content. Therefore, a better understanding of the influence of unrestricted computer-mediated text-based communication – i.e. chat

– on social behavior is desirable (Hegtvedt, 2007; Bicchieri & Lev-On, 2007).

The present study examined the influence of communication on distributive outcomes in three-person network decisions, thus contributing to the emerging literature on the effect of text-based communication on behavior in the laboratory (Gantner et al., 2019). However, while most previous studies focused on equitable and equal distributions (?, ?, e.g.)]Hegtvegt2007, McGinn2012, the present study also includes the distributive principle of need that had been neglected previously (?, ?, see)for an exception]Kittel2020.

The main result is that unrestricted communication leads to different distributive outcomes than restricted communication. The frequency of entitlement or equity-based distributions decreases notably, whereas equality-based distributions increase slightly and need-based distributions increase substantially when communication is free-form. A content analysis of the chat material supports both the norm-based and the group-based hypotheses currently discussed in the literature on the function of communication content in laboratory experiments (?, ?, e.g.)]Bicchieri2002. Whereas references to the norm of equality increase the frequency of equal outcomes and decrease the frequency of need-based and entitlement/equity-based outcomes, references to immediate interaction partners increase entitlement/equity-based distributions and decrease equality and need-based distributions. Examining the possibility that group identity requires a longer time horizon in terms of repeated interaction between the same individuals leads to ambiguous results. Whereas (inclusive) references to the entire network are more frequent and (exclusive) references to the immediate interaction partners are less frequent, no significant effect of group references could be measured. Comparing the chat protocols of both experiments indicates that communication is used differently when interacting with strangers compared to partner-interactions . More research is needed to disentangle the effect of repeated interaction on group identity formation in order to assess the strength of the group-based explanation of communication content on behavior

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